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EDT 514

**Lesson Plan 1**

* **Lesson Title**
  + Factor a Greatest Common Monomial (GCM) out of polynomials
* **Short Description of Lesson**
  + Students will review how to find the greatest common factor from a list of numbers. Once they have a good grasp on that concept, the class will move on to a lecture on how to factor a greatest common monomial out of a polynomial. They will practice this skill in different group sizes and I will assess them in various ways. After I feel this concept is mastered, they will use it to solve an equation.
* **Classroom Layout and Grouping of Students**
* The classroom is set up in groups of four. This is most conducive to the three main ways the students will be working; in pairs, in groups of four, and on their own. The groups will be arranged so that no student has their back to the Smart Board, which is the main tool I will be using to guide my instruction. For this lesson, each student will have paper, a pencil, and a graphing calculator and each group will get one Mobi device.
* **Students’ Present Level of Performance and Skills**
  + The students have worked with the concept of Greatest Common Factors prior to this lesson in Pre-Algebra. They have used the Mobi Devices and the CPS controllers in the past, as well, so we will not need to spend too much time reviewing how to use them. To ensure that the students have the prior knowledge necessary to be successful for this lesson, their warm up problems focuse on those skills.
* **Instructional Objectives**
  + Students will be able to factor a greatest common monomial out of a polynomial
  + Students will solve an equation by factoring out a greatest common monomial.
  + Students will create a story problem that uses factoring a greatest common monomial in its solution.
* **Grade Level Content Expectations**
  + **A1.1.3** Factor algebraic expressions using, for example, greatest common factor, grouping, and the special product identities.
  + **A1.1.4** Add, subtract, multiply, and simplify polynomials and rational expressions.
  + **A1.1.5** Divide a polynomial by a monomial.
  + **A1.2.1** Write equations and inequalities with one or two variables to represent mathematical or applied situations, and solve.
* **METS-S: Michigan Education Technology Standards for Students**
  + **9-12.TC.2**. Use an online tutorial and discuss the benefits and disadvantages of this method of learning
  + **9-12.CT.1.** Use digital resources (e.g., educational software, simulations, models) for problem solving and independentlearning
* **Materials, Resources, and Technology**
  + Smart Board
  + Smart Board activities from exchanges.smarttech.com
  + CPS Controllers
  + Mobi Devices
  + Online tutorials from Khanacademy.org
    - [**http://www.khanacademy.org/video/monomial-greatest-common-factor?topic=core-algebra**](http://www.khanacademy.org/video/monomial-greatest-common-factor?topic=core-algebra)
    - [**http://www.khanacademy.org/video/gcf-to-factor-a-polynomial?topic=developmental-math-2**](http://www.khanacademy.org/video/gcf-to-factor-a-polynomial?topic=developmental-math-2)
  + McDougal Little Algebra 1 textbook
  + Paper
  + Pencils
  + Calculators
* **Instructional Procedures**
  + **Day 1:** We will start off with a review of Greatest Common Factors (GCFs) in relation to just numbers. When the students enter the classroom, they will be instructed to work with a partner to write down everything they know about GCFs and we will make a list on the Smart Board. After this students will work in their groups of four to each explain how to do one problem, provided for them by the teacher, to the rest of their group members. Once this is complete and I feel students have a good understanding on GCFs, the teacher will show the Khanacademy videos on how to factor a Greatest Common Monomial (GCM) out of a polynomial. After this I will do several examples on the board. The students will then work with a partner to complete a “now you try” problem. After the teacher has walked around and answered all questions, the students will be given a CPS “miniquiz” with two questions involving factoring a GCM out of a polynomial. Once all answers are submitted and results are discussed, students will receive their homework assignment, problems from the text book, for the night. Students are expected to return to class the following day with the assignment completed.
  + **Day 2:** Upon entering class, students will expected to complete the warm-up problem “Solve 2x2+8x=0.” We will go over it as a class after several minutes and then we will check the homework from the night before. Each group will be expected to complete several of the homework problems on the Smart Board using their Mobi device. This will allow for any uncertainties about the homework to be addressed. After this the students will turn in their homework to be checked by the teacher later. After this is done, the class will begin a discussion on real life applications of the factoring a GCM, one of which is vertical motion. Students will then work with a partner within their group to create a GCM story problem that involves real life application. This problem will be exchanged with the other partnership in their group who will then solve the problem. Once all problems are solved, partnerships will be encouraged to share their story problem with the class. The class will end with another homework assignment, a worksheet, for them to begin in class but complete at home.
* **Supplemental Activities: Extensions and Remediation** 
  + Every day the students will have a warm-up problem on the board for them when they enter class. The first day is to write down everything they know about GCFs and second day is to factor a GCM out of a polynomial. Also, every day the students will have homework assignments that they are to begin in class, so they can hopefully clear up any confusion they are having with the concept, and are expected to finish before returning to class the next day. The first night the homework assignment will be an assignment from their text book so they can use their book as a reference if needed. The second day the homework assignment will be a worksheet.
* **Assessment**
  + Formal assessments include the homework that is turned in daily and the test that will be given at the end of the unit.
  + Informal assessments include the CPS mini quiz and the discussion/group work time conducted during class.
* **Student Products**
  + The student products include 2 homework assignments and a GCM story problem created in partnerships.

**TPACK Analysis**

* **Content:** Understand how to factor a Greatest Common Monomial out of a polynomial with the ultimate goal of solving a polynomial equation.
* **Pedagogy:** 
  + Direct Instruction is used when initial teaching the students the new concepts and when explaining the assignments. This allows for the students to get the correct information and to gain initial understanding.
  + Cooperative Learning Groups is used to delve deeper into the content while completing the in class activities. It also allows for the students who are having difficulties with the concept to gain help from a peer.
  + Class Discussions is used to encourage higher level thinking and provide different insight and opinions on the concepts.
  + Independent Work is used to ensure the student is getting practice with the concept and has a good grasp on the material.
* **Technology:** 
  + A Smart Board is used to present information to the students and allow them to share information with one another.
  + Online tutorial videos from Khanacademy.org are presented on the Smart Board to aid in the students learning of the new content.
  + Calculators are used to help with finding common factors of numbers.
  + Mobi devices are used by the groups to share their information with the class.
  + CPS controllers are used as an assessment tool.
* **Content Knowledge:**  The teacher has B.S. in Mathematics so they are very competent when it comes to the subject matter. This is also not the teachers first year teaching this content so they have worked with this lesson in the past.
* **Pedagogy Knowledge:** Many of the students struggle with math or do not enjoy the subject. It is the teacher’s responsibility to present the material in a meaningful way by providing real life applications and making it engaging through the use of technology, videos, and group work. This age group of students tends to feel successful when they are able to talk through problems with their peers which is why group work will be utilized a great deal. However, in order to gain a good understanding of mathematical concepts, practice and repetition are necessary, hence why daily homework assignments are given.
* **Technology Knowledge:** The teacher is currently pursuing an Educational Technology Endorsement and has attended many after school training sessions on how to use all the technologies being used in this lesson. They are more than able to successfully utilize these resources.
* **Pedagogical Content Knowledge:** Many students find mathematics difficult and boring. In order to address these concerns, it is the educator’s responsibility to make the content engaging and to ensure that all students are able to feel success and have an understanding of the content. One of the most important challenges of a teacher is to make the material being taught is meaningful for the students. Students are more motivated to learn when they are interested in what they are learning and when they can see its relevance to their lives outside of school. By having the students think about real life applications of the content and to incorporate technology, which is such a relevant part of their everyday life, the students are more likely to enjoy and understand the concepts being taught. Also, by allowing them to work in groups they are able to help one another with concepts they may not understand and they are more likely to view their learning experience as an enjoyable time because social interaction in involved.
* **Technological Content Knowledge:** Since technology is so ingrained in students’ everyday life, incorporating it into the classroom will help enhance their learning experience. This is especially true in mathematics. With the creation of things such as online tutorials and virtual manipulatives, the teaching of mathematics has been greatly enhances and the likelihood of more children comprehending the concepts has increased drastically. Technology allows students to engage in hands on activities, explore other explanations of a concept, and delve deeper into content which helps them to retain more knowledge and be more willing to participate in higher level thinking.
* **Technological Pedagogical Knowledge** By implementing technology into this lesson, the students are more likely to be interested in an otherwise mundane topic. Allowing them to work in groups and use devices like CPS controllers and Mobi devices, the students feel that they are active participants in the learning experience. When a task such as “coming up to the chalk board to write their homework answer” is transformed into “using a Mobi tablet to write it on the board from their desk”, the students’ level of interest and willingness to participate increases drastically. Furthermore, where a “ticket out the door” used to be a battle, allowing them to submit their answer using a CPS controller and seeing immediate results makes it appear more like a game and provides them, and the teacher, with instant feedback on whether or not the day’s lesson was a success. Also, incorporating things like the online tutorials allows the students to see another “spin” on what the teacher is teaching and provides them with a resource they can use outside of the classroom if they need a “refresher” on the concept while working on homework or studying for their test.
* **Technological Pedagogical Content Knowledge:** By incorporating all of these elements, it is likely that the students understanding of the concepts and enjoyment of the lesson will be greatly improved. By incorporating technology and various instructional methods, more students are likely to find success during than lesson than if the teacher had stood in front of the class and lectured from a textbook. According to Diana Lawrence-Brown, “ Differentiated instructional planning recognizes and supports the classroom as a community to which age peers belong, where they can and should be nourished as individual learners. “ This lesson incorporates a great deal of differentiation, which is essential in a class with special education students. Therefore, all students should find a moment of success during this lesson. That one moment of success is all that is needed for the student to decide this concept isn’t “stupid” or a “waste of their time” and that will allow them to open up to it.

**Reference**

[Lawrence-Brown, Diana](javascript:__doLinkPostBack('','ss%7E%7EAU%20%22Lawrence%2DBrown%2C%20Diana%22%7C%7Csl%7E%7Erl','');). “Differentiated Instruction: Inclusive Strategies for Standards-Based Learning That Benefit the Whole Class.”*[American Secondary Education](javascript:__doLinkPostBack('','mdb%7E%7Eeft%7C%7Cjdb%7E%7Eeftjnh%7C%7Css%7E%7EJN%20%22American%20Secondary%20Education%22%7C%7Csl%7E%7Ejh','');" \o "Search for American Secondary Education)* (2004): 34-. *ProQuest Technology Collection.* Web. 10 Feb. 2012.